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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

EVALUATING THE EFFECTIVENESS OF NAVY MEDICAL CORPS ACCESSION PROGRAMS

by

Juli Schmidt
Walter Colvin

March 2012

Thesis Co-Advisor:s

Elda Pema
Dina Shatnawi

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REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE March 2012	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE Evaluating the Effectiveness of Navy Medical Corps Accession Programs			5. FUNDING NUMBERS	
6. AUTHOR(S) Juli Schmidt and Walter Colvin				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number ____N/A____.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			12b. DISTRIBUTION CODE A	
13. ABSTRACT (maximum 200 words) This study estimates and compares the retention rates of the various recruitment programs for the Navy's Medical Corps officers. The study is designed to analyze whether current accession plans yield adequate retention rates to maintain the long-term viability of the Medical Corps. The data included 3,568 Medical Corps officers who accessed into the Navy between 1996 and 2006. For the purposes of this study, retention is defined as an officer staying one year past their initial minimum service obligation. Our results indicate that medical officers accessed via the Uniformed Services University of the Health Sciences and Direct Accession programs have higher retention rates compared to officers from the Armed Forces Health Professions Scholarship programs. These results hold true for female, male, and minority Medical Corps officers. Further research is recommended to fully quantify the cost of each accession program and their benefits on long- and short-term retention.				
14. SUBJECT TERMS Manpower/Supply, Retention, Recruiting, Personnel/Attrition, Manpower Policy Issues, Requirements/Determination, Distribution			15. NUMBER OF PAGES 89	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU	

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18

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**EVALUATING THE EFFECTIVENESS OF NAVY MEDICAL CORPS
ACCESSION PROGRAMS**

Juli Schmidt

Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 2000

Walter Colvin

Lieutenant, United States Navy
B.S., Southern Illinois University, 2003
MPH, University of South Carolina, 2007

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

**NAVAL POSTGRADUATE SCHOOL
March 2012**

Author: Juli Schmidt

Walter Colvin

Approved by: Elda Pema
Thesis Co-Advisor

Dina Shatnawi
Thesis Co-Advisor

William Gates
Dean, Graduate School of Business and Public Policy

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ABSTRACT

This study estimates and compares the retention rates of the various recruitment programs for the Navy's Medical Corps officers. The study is designed to analyze whether current accession plans yield adequate retention rates to maintain the long-term viability of the Medical Corps. The data included 3,568 Medical Corps officers who accessed into the Navy between 1996 and 2006. For the purposes of this study, retention is defined as an officer staying one year past their initial minimum service obligation. Our results indicate that medical officers accessed via the Uniformed Services University of the Health Sciences and Direct Accession programs have higher retention rates compared to officers from the Armed Forces Health Professions Scholarship programs. These results hold true for female, male, and minority Medical Corps officers. Further research is recommended to fully quantify the cost of each accession program and their benefits on long- and short-term retention.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADO	Active Duty Obligation
AFHPSP	Armed Forces Health Professions Scholarship Program
ASP	Additional Special Pay
BCP	Board Certified Pay
BES	Budget Estimate Submission
BUMED	Bureau of Medicine and Surgery
BUMIS	Bureau of Medicine and Surgery Manpower Information System
BUPERS	Bureau of Personnel
CBO	Congressional Budget Office
CME	Continuing Medical Education
CNA	Center for Naval Analyses
CO	Commanding Officer
CSRB	Critical Skills Retention Bonuses
CWSAB	Critical Wartime Skills Accession Bonus
DA	Direct Accession
DACMC	Defense Advisory Committee of Military Compensation
DCO	Direct Commission Officer
DMDC	Defense Manpower Data Center
DoD	Department of Defense
FAP	Financial Assistance Program
FS	Flight Surgeon
FY	Fiscal Year
FYDP	Future Years Defense Plan
GAO	General Accounting Office
GME	Graduate Medical Education
GMO	General Medical Officer
GPA	Grade Point Average

HPLRP	Health Professions Loan Repayment Program
HPSP	Health Professions Scholarship Program
HSCP	Health Service Collegiate Program
IRR	Individual Ready Reserve
ISP	Incentive Special Pay
MC	Medical Corps
MHS	Military Health System
MSP	Multiyear Special Pay
MPTE	Manpower, Personnel, Training, and Education
MSP	Multiyear Special Pay
MSO	Military Service Obligation
NADDS	Navy Active Duty Delayed Specialists Program
NAVADMIN	Navy Administrative Message
NAVET	Navy Veteran
NAVMED	Navy Medicine
NDAA	National Defense Authorization Act
NRC	Navy Recruiting Command
NTF-21	Navy Total Force Vision for the 21 st Century
OPA	Officer Programs Authorization
OPNAV	Office of the Chief of Naval Operations
OSD	Obligated Service Date
POM	Program Objective Memorandum
PPBE	Planning, Programming, Budgeting, and Execution
QRMC	Quadrennial Review of Military Compensation
RAD	Release from Active Duty
RMC	Regular Military Compensation
S1	Active Standby Reserve
S2	Inactive Standby Reserve
SASC	Senate Armed Services Committee
SELRES	Selected Reserve

UMO	Underwater Medical Officer
USNR	United States Navy Reserve
USNR-R	United States Navy Ready Reserve
USNR-S1	United States Navy Active Ready Reserve
USNR-S2	United States Navy Inactive Ready Reserve
USUHS	Uniformed Services University of the Health Sciences
VSP	Variable Special Pay

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ACKNOWLEDGMENTS

The authors would like to acknowledge the assistance provided by several people over the eight months it took to complete this research. A special thank you to our co-advisors, Professor Elda Pema and Professor Dina Shatnawi. It was a pleasure to work with Professor Shatnawi as she advised her first manpower curriculum thesis at the Naval Postgraduate School. We could not have conducted any of our research without the data provided to us by Mr. Tony Frabutt at the Career Planning Office at the Bureau of Medicine and Surgery, Mr. Rudy Sladyk at Navy Recruiting Command, Mr. David Andersen at Navy Medicine Manpower, Personnel, Training & Education Command (NAVMED MPT&E), and LCDR Jeanette Bederman at the Full Time Support Community Manager office. We are extremely fortunate to have the support of Ms. Susan Hawthorne at the Thesis Processing Office and our editor, Mr. Richard Mastowski. Without their patience and guidance the race to the finish line would have been much more challenging.

Most importantly, our journey and success would not be possible without the unwavering encouragement, support, and love from our families. Thank You.

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I. INTRODUCTION

A. BACKGROUND

Navy Medical Corps (MC) retention and accession planning has been extensively researched. This study will further that research by exploring the costs associated with each MC accession program. Recruiting physicians is just as costly, if not more costly, to the Navy as retaining those physicians. It is important to evaluate the cost per accession. The Navy recruits medical students, residents and fellows, licensed physicians, and board certified specialists. This study will compare the retention rates and costs associated with recruiting these individuals, and will evaluate which program would be more effective at capturing the talent that the Navy needs to meet its health care mission. Policy analysts revisit this problem periodically. Given the stress from a protracted war, coupled with a dismal economy, it is just as important now as ever to revisit these policy issues.

Retention is one of the most important aspects of workforce planning. Navy career planning offices, in conjunction with community managers, forecast the Navy's projected loss rate, or attrition rates, by community. They balance the needs of that community against what the projected accessions are so that each community is optimally manned. The Navy builds its accession plans and policies based on these forecasts and needs. Finding and retaining the appropriate personnel is challenging.

Navy Medicine is comprised of four corps: Navy MC, Dental Corps, Nurse Corps, and Medical Service Corps. This research will only concentrate on the Navy MC.

Medical professionals are in high demand and, as a result, the Navy is experiencing shortfalls in certain communities. This research will build upon the recommendations from the General Accounting Office (GAO) report, *Military Personnel: Status of Accession, Retention, and End Strength for Military Medical Officers and Preliminary Observations Regarding Accession and Retention Challenges*. In addition this research will use the recommendations from the GAO report to develop the regression models used in this study. In 2009, the Senate Armed Services Committee requested that the Comptroller General conduct an assessment of the medical personnel requirements of the Department of Defense (DoD). This report accompanied the

National Defense Authorization Act for Fiscal Year (FY) 2009, and it provided the Secretary of Defense and the Secretary of the Navy with a broad overview on the status of the entire Navy Medicine enterprise.¹

The desired outcomes are to have the correct number of people accessed based upon recruitment goals, and to ensure that the MC community is adequately manned based on the number of authorized billets and end-strength requirements. This is the Navy MC's vision statement:

NAVY MEDICINE VISION:

The United States Navy Medical Department will remain an agile, flexible, professionally anchored organization with the ability to execute Force Health Protection and all other aspects of expeditionary medical operations to support our Navy-Marine Corps warriors in any conflict, humanitarian assistance, disaster relief, or other operations in which medical is needed for sustainment and success. We will prevent injury and illness when possible, and always be capable of service to mitigate whatever adversary, ailment, illness, or malady may affect our warriors. We must be capable of providing powerful assistance as a joint medical component with other services, the interagency community, allies and international partners, as well as medical non-governmental organizations and corporations. We must be a superbly trained and led team of diverse Sailors and civilians, who are grounded in our medical ethos, core values and commitment to mission readiness and accomplishment.²

B. PURPOSE

The purpose of this study is to evaluate how effectively the MC community recruits physicians. Retention is an important facet in the manning of the MC, and it has a significant impact on the ability to meet the Navy Medicine mission. The Navy has various accession programs aimed at recruiting physicians during different points in their civilian training. This study will analyze the retention rates for each of the Navy's MC accession programs at the physicians' first stay/leave decision point, otherwise referred to as the initial Military Service Obligation (MSO) date or end of obligated service date (OSD). A physician can leave the Navy at this point, and will have gained invaluable

¹ General Accounting Office, *Military Personnel: Status of Accession, Retention, and End Strength for Military Medical Officers and Preliminary Observations Regarding Accession and Retention Challenges*, GAO-09-469R (Washington, D.C., April 16, 2009), Briefing to Congressional Committees, 3.

² "Navy Medicine Strategic Plan," Navy Bureau of Medicine and Surgery, last accessed October 13, 2011, <http://www.med.navy.mil>.

hands-on training and leadership experience. This study will examine whether or not these accession programs are serving their intended purpose, and if they are having a positive impact on retention. This research will also evaluate the life-cycle costs of these accession programs, and assess the efficacy of the relevant policies that guide decision makers.

C. RESEARCH QUESTIONS

The Navy MC recruits physicians at all levels of training. This research will use data from the Bureau of Medicine and Surgery (BUMED); Navy Recruiting Command (NRC); and Navy Medicine Manpower, Personnel, Training, and Education (MPTE). It will compare the retention rates of the various accession sources for both the Active and Reserve Component physicians, and the costs associated with each program.

A secondary area of research will be to determine if the Navy should revisit its recruitment goals and accessions, and potentially reallocate funding. This research will remain focused on accession programs, and long-term community health to ensure that Navy Medicine continues to meet its dual mission of combat readiness and dependent care.

The primary research questions are:

- Does the current accession plan yield adequate retention rates to maintain the long-term viability of the Navy's MC community?
- Does retention vary by accession source and career path?

The secondary research questions are:

- What is the optimal mix of accessions to fill long-term billet requirements?
- Do Armed Forces Health Professions Scholarship Program (HPSP) recipients leave the Navy at a higher rate than Uniformed Services University of the Health Sciences (USUHS) graduates, or Navy Active Duty Delayed Specialists (NADDS) Program and Direct Accessions (DAs) applicants?

- Do Reserve physicians that enter as Direct Commission Officers (DCOs) leave the Navy at a higher rate than prior service/Navy Veteran (NAVET) physicians?

D. SCOPE AND METHODOLOGY

The scope will include: (1) a review of the Navy's MC accession and retention plans; (2) multivariate model development; (3) end-strength analysis based on long-term community goals; and (4) results analysis.

E. ORGANIZATION

This study is organized into six chapters. Chapter I provides an introduction and Chapter II is a literature review that discusses previous research in this field. Chapter III includes a description of the data used in this study, and will provide a presentation of the descriptive statistics. It will also describe the variables used in each of the models. Chapter IV will review the details of the models and discuss results associated with each one. Chapter V will include a summary of the results, conclusions, and recommendations.

II. LITERATURE REVIEW

A. INTRODUCTION

The Navy's Total Force initiative supports a lifetime of service. The purpose is to seamlessly integrate the Active Component, Reserve Component, and civilian workforce. It is imperative that there is a mutually beneficial relationship and respect among these entities to support the mission, the sailor, and the overall needs of the Navy. The Navy MC strives to meet this expectation at each level of the planning and requirements process.

The MC community is tasked with finding recruitment and retention solutions that are fiscally responsible and sustainable. Often times these initiatives are undertaken while operating under a constrained budget. The Navy needs to find the most cost-effective means of manning its billets. Navy Medicine will maintain the right workforce to deliver medical capabilities across the full range of military operations through the appropriate mix of accession, retention, education, and training incentives.

The Navy's MC community strives to remain relevant, knowledgeable, and professional through training and continued educational opportunities. Its strategic plans are derived from the Surgeon General's priorities, and they are focused on fulfilling Navy Medicine's vision for an agile, flexible, ready, and professional medical organization that is committed to their mission of Force Health Protection, and patient- and family-centered care.

As a nation, we are faced with a unique set of national security challenges at home and abroad. Objectives, cascading missions and strategies are all integrated to create a strategic plan to guide each community within the Navy. "The Navy must create a human capital investment strategy capable of placing the right people with the right skills, at the right time and place, and at the best value, to execute its global missions."³

³ "Navy Human Resources Community Strategic Plan: 2010-2015, May 2010," BUPERS online, last accessed November 2, 2011, http://www.public.navy.mil/bupers-npc/officer/Detailing/rlstaffcorps/HR/Documents/HR_Strategic_Plan.pdf.

All plans are aligned with the Department of the Navy Human Capital Strategy, the Chief of Naval Operation's Maritime Strategy, and other higher-level guidance.

The United States Navy's strategic priorities are set forth in the Navy's Total Force Vision for the 21st Century (NTF-21) and the Navy Personnel Command's 2020 Vision statements. The Total Force mission defines our workforce and helps execute policies and programs to attract, recruit, develop, assign, and retain the best possible enlisted, officer, and civilian personnel to best support the organization. With the maximization of our available human resources, our Navy can gain the edge and create optimal readiness and improved capability to meet our global objectives.⁴

B. OVERVIEW OF ACCESSION, RETENTION, AND END STRENGTH FOR THE NAVY

The costs of medical school and specialty training can create a tipping point, where money invested upfront may not be worth the expense when physicians leave the Navy at a higher than projected rate. What it boils down to for policy makers is which is more important—short- or long-term retention.

Recruitment plans have a significant role in short-term and long-term retention. It is important to evaluate how the MC recruits medical professionals at all levels of civilian training. This study will evaluate if the Navy should consider a shift in funding to an accession program that has higher retention rates. This research will also evaluate life-cycle costs of these accession programs.

Navy Recruiting Command's Mission Statement is:

Our mission is to recruit the best quality men and women from the diverse population of our country to fill the Navy's ranks and focus on the outcomes by (1) Executing best business practices and (2) Maintaining an effective, motivated integrated active and reserve recruiting force.⁵

⁴ "Navy Human Resources Community Strategic Plan: 2010-2015, May 2010," BUPERS online, last accessed November 2, 2011, http://www.public.navy.mil/bupers-npc/officer/Detailing/rlstaffcorps/HR/Documents/HR_Strategic_Plan.pdf.

⁵ Navy Recruiting Command, last accessed November 14, 2011, <http://www.cnrc.navy.mil/about/about.htm>.

Delivering cost-effective services is vital to the Navy's mission to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas.

1. Accession Defined

An accession is when the Navy recruits a new medical officer into the service. This "new accession" status pertains to both the Active and Reserve Components. Recruiters are tasked with using financial incentives, programs, and advertising to attract potential applicants. The successful completion of this recruitment process results in an "access" for the Navy. Navy planners set accession goals each fiscal year, based upon forecasting models. The Navy maintains data on the type of accession program that the applicant applies to, and this information helps shape short- and long-term accession planning.

There are various programs that an MC applicant can access under. These include:

- **Armed Forces Health Professions Scholarship Program (AFHPSP):** This program creates a pipeline of potential Navy physicians who will access onto active duty upon the successful completion of medical school. It accounts for more than half of physician accessions.
 - AFHPSP provides 100% tuition assistance, a monthly stipend of \$2,088, and full reimbursement for any required expenses as a medical student.
 - Eligible for a sign-on bonus of \$20,000.
 - AFHPSP students may access immediately upon completion of medical school, or they may continue with their graduate medical education (GME) in residency in a military or a civilian program prior to entering active duty.
 - Minimum MSO of three years. If sponsored for four years, the student has an MSO of at least four years.
- **DA Program:** The Active and Reserve Components access fully-trained physicians who are licensed and/or board certified in their specialty.

- The Reserve component refers to their direct accession program as DCO.
- DAs and DCOs are eligible for various financial incentives.
- Minimum MSO of three years.
- **Recall:** These are Reserve officers recalled to active duty, usually in undermanned specialties. It is used as a valve to complement student programs; however, it has had limited success in the MC.
 - Minimum MSO of three years.
 - May be eligible for financial incentives.
- **USUHS:** Triservice medical school with limited accessions per year. The maximum authorized accessions are typically limited to 51 students, which is approximately 15%-20% of the total medical accessions each year.
 - Minimum MSO of four years.
- **Health Service Collegiate Program (HSCP)⁶:** Similar to AFHPSP, this program creates a pipeline of potential Navy physicians who will access onto active duty upon the successful completion of medical school.
 - Students earn approximately \$50,000 per year in salary while in medical school.
 - Entitled to all pay and privileges of an active duty service member.
 - Earn time toward retirement.
 - Approximately \$10,000 increased in annual salary upon graduation.

Financial Incentives:

- **Health Professions Loan Repayment Program (HPLRP):** This is a loan repayment program that provides student loan debt relief to DA applicants. It is only offered to physicians at the initial accession point.
- **Financial Assistance Program (FAP):** This is an inactive Ready Reserve program for physicians in civilian graduate education programs.

⁶ Pilot program for the MC in FY '08; therefore, not included in this research.

Participants are appointed as a commissioned officer in the Naval Reserve and enter active duty upon completion of their training.

- Residents and fellows (GME) receive an annual grant of approximately \$45,000 during their training (approximately \$275,000 during their residency).
- Monthly stipend of approximately \$2,088.
- Minimum MSO of three years.⁷

2. What is an Accession Plan?

The Navy's accession plan is defined by validated community accession requirements that have been determined from predicted attrition and retention rates. The accession plan is used for the next FY and the Future Years Defense Plan (FYDP).

The FYDP displays, by FY, total DoD resources and force structure information for the prior year, current year, budget year, and the following four years (the "out years"). It also includes force structure information for an additional three years beyond the four "out years." The FYDP is updated twice during the Planning, Programming, Budgeting, and Execution (PPBE) cycle. The first time is in August/September to reflect the services' combined Program Objective Memorandum/Budget Estimate Submission (POM/BES), and the second time is in January of the following year, to reflect the budget that will be submitted to Congress the following month. The purpose of the PPBE process is to allocate resources within the DoD. The PPBE is a cyclic process that provides the mechanisms for decision making, and provides the opportunity to reexamine prior decisions in light of changes in the environment. This is especially important and relevant to managing and planning for Navy accessions. The accession plan is a reflection of available resources and, in particular for this research, personnel.

The FYDP is considered an internal DoD working document and is closely held within the DoD. Since the FYDP out year programs reflect internal planning

⁷ Navy Healthcare Careers, last accessed November 15, 2011, <http://www.navy.com/careers/healthcare/>.

assumptions, it assists MC planners with identifying target numbers for recruiting and accession quotas. As such, planners can revise the accession plan throughout the execution year.

3. What is a Strength Plan?

The MC Community Manager will develop officer community strength plans in accordance with accession policy plans guidance, and submit annually or as required. These reports are reviewed and validated monthly and include the inventory (number of personnel currently onboard), gains (accessions) to date, losses to date, promotions/grade changes to date, designator changes to date, and current FY inventory versus current FY officer program authorization. Policy decisions are guided by the U.S. Code for Personnel Strengths, as cited below.

U.S. Code: Title 10, Subtitle A, Part I, Chapter 2, § 115: Personnel Strengths: Requirement for Annual Authorization.

a. Active Duty and Selected Reserve End Strengths to be Authorized by Law

Congress shall authorize personnel strength levels for each FY for each of the following:

(1) The end strength for each of the armed forces (other than the Coast Guard) for (A) active-duty personnel who are to be paid from funds appropriated for active-duty personnel unless on active duty pursuant to subsection (b), and (B) active-duty personnel and full-time National Guard duty personnel who are to be paid from funds appropriated for reserve personnel unless on active duty or full-time National Guard duty pursuant to subsection (b).

(2) The end strength for the Selected Reserve of each reserve component of the armed forces.⁸

Community Managers revise strength plans throughout the execution year, and analyze loss rates and retention data to ascertain trends. They also

⁸ Title 10 USC § 115, “Personnel Strengths: Requirement For Annual Authorization,” Cornell University Law School, The Legal Information Institute, last accessed November 15, 2011, http://www.law.cornell.edu/uscode/uscode_sec_10_00000115----000-.html.

evaluate officer requests for recall to active duty, interservice transfers, lateral transfers, and retirements in regard to community end strength and need. Community Managers utilize Officer Program Authorization (OPA) as guidance in the application of all force-shaping tools. The OPA is also known as the “inventory,” and will be referred to as OPA throughout this discussion. It is most common to analyze inventory as it relates to decision making and policy planning.

C. THE TENTH QUADRENNIAL REVIEW OF MILITARY COMPENSATION

Federal law directs that the President will complete “a review of the principles and concepts of the compensation system for members of the uniformed services.”⁹ This began in 1965 with the First Quadrennial Review of Military Compensation (QRMC). Ten reviews have been completed since. These reviews capture important issues pertaining to the costs associated with maintaining a viable force. They provide accurate analyses and recommendations that lead to improvements in the compensation system, and enable the services to remain competitive in labor markets while responding to rapidly changing operational needs.

For the Tenth QRMC, President George W. Bush’s guidance was for the services to:

Continue to recruit and retain highly qualified personnel for the uniformed services as they transform themselves to meet new challenges, the departments concerned must offer, in addition to challenging and rewarding duties, compensation appropriate to the services rendered to the Nation. The departments also must apply the substantial taxpayer resources devoted to uniformed services compensation in the most effective manner possible.¹⁰

The QRMC underscores the importance of recruitment and retention, and serves as a reminder that these imperatives must be appropriately balanced using precious financial assets.

⁹ Title 37 U.S.C. § 1008, “Presidential recommendations concerning adjustments and changes in pay and allowances,” last accessed November 21, 2011, <http://codes.lp.findlaw.com/uscode/37/19/1008>.

¹⁰ Office of the Assistant Secretary of Defense, *The Report of the Tenth Quadrennial Review of Military Compensation (QRMC)*, (Washington, D.C.: GPO, 2008), ix.

This report also considered recommendations from the Defense Advisory Committee of Military Compensation (DACMC) report, an addendum to the initial assessment of the Tenth QMRC. The data, analysis, and analytic framework included in the DACMC report was essential to implementing new legislation that supported the consolidation of Special and Incentive Pays (applicable to physicians), which was ultimately included in the 2008 National Defense Authorization Act (NDAA).

The report from the Tenth QMRC recognized that between FY '95 and '06 there were more civilians and contractors hired to provide health care services to the armed forces. This caused reductions in the end strength of active duty health care professionals. It noted that the authorized number of active duty physicians (billets) dropped by 12.6%, while concurrently the actual inventories (OPA) reflected a 13.8% decline in physicians.¹¹ The number of physicians serving on active duty was declining at a more rapid rate than the rate of billet reductions.

The NDAA addressed this issue and suggested a careful examination of compensation issues pertaining to the uniformed medical personnel of the DoD. This high-profile document notes the importance of reviewing the current inventory of physicians, exploring the underlying causes for the challenges facing the military in this professional group, and evaluates the effectiveness of existing recruitment and retention tools to meet force needs. These concerns continue to be relevant to today's MC community.¹²

When issued, the report from the Tenth QMRC showed that in 2007 military personnel costs totaled over \$123 billion and made up 23% of defense spending.¹³

D. MEDICAL CORPS SPECIAL PAY SYSTEM

It is important to understand the special pay system and how it relates to a physician's salary. There have been a number of studies that have examined if these

¹¹ Office of the Assistant Secretary of Defense, *The Report of the Tenth Quadrennial Review of Military Compensation (QMRC)*, (Washington, D.C.: GPO, 2008), 41.

¹² Ibid., 41.

¹³ Office of the Assistant Secretary of Defense, *The Report of the Tenth Quadrennial Review of Military Compensation (QMRC)*, (Washington, D.C.: GPO, 2008), 47.

special pays are serving their intended purpose, thus having a positive impact on retention. That is beyond the scope of this study; however, it is equally important to understand how they fit into the life-cycle costs of the Navy's accession programs, and how policy makers use them. Each of these special pays is factored into a physicians' total compensation in the Navy. Military pay is a critical factor that affects retention, and we will use specialty types as a proxy for these pays in our study. It is important to have a rudimentary understanding of what physicians are compensated for in order to effectively analyze the likelihood of a physician staying or leaving the Navy in pursuit of higher pay differentials.

- Variable Special Pay (VSP) – Entitlement
- Board Certified Pay (BCP) – Entitlement
- Additional Special Pay (ASP) – Entitlement
- Incentive Special Pay (ISP) – Discretionary Bonus (27 rates)
- Multi-Year Special Pay (MSP) – Discretionary Bonus (27 rates; tiered 2, 3, and 4 years)
- New Medical Corps Accession Bonus
- Health Professional Loan Repayment Program – (HPLRP) Accessions and Retention
- Critical Wartime Skills Accession Bonus(CWSAB)¹⁴

E. MEDICAL CORPS CAREER PROGRESSION

Figure 1 illustrates the typical career progression for a Navy physician. It is important to understand how this timeline relates to recruiting, and to the factors a physician considers at the initial stay/leave decision point. Some of those factors include special pays, training opportunities, promotions, and increased scope of practice.¹⁵

¹⁴ Office of the Chief of Naval Operations, OPNAV Instruction 7220.17: "Special Pay for Medical Corps, Dental Corps, Medical Service Corps and Nurse Corps Officers, December 2005." BUPERS Reference Library, last accessed February 1, 2012, <http://www.public.navy.mil/BUPERS-NPC/REFERENCE/Pages/default.aspx>.

¹⁵ "Medical Corps Active Component Community Management," brief to MC at Bureau of Medicine and Surgery, Washington, D.C., October 2010, slides 10–17.

Notional Medical Corps Career Progression And Incentives

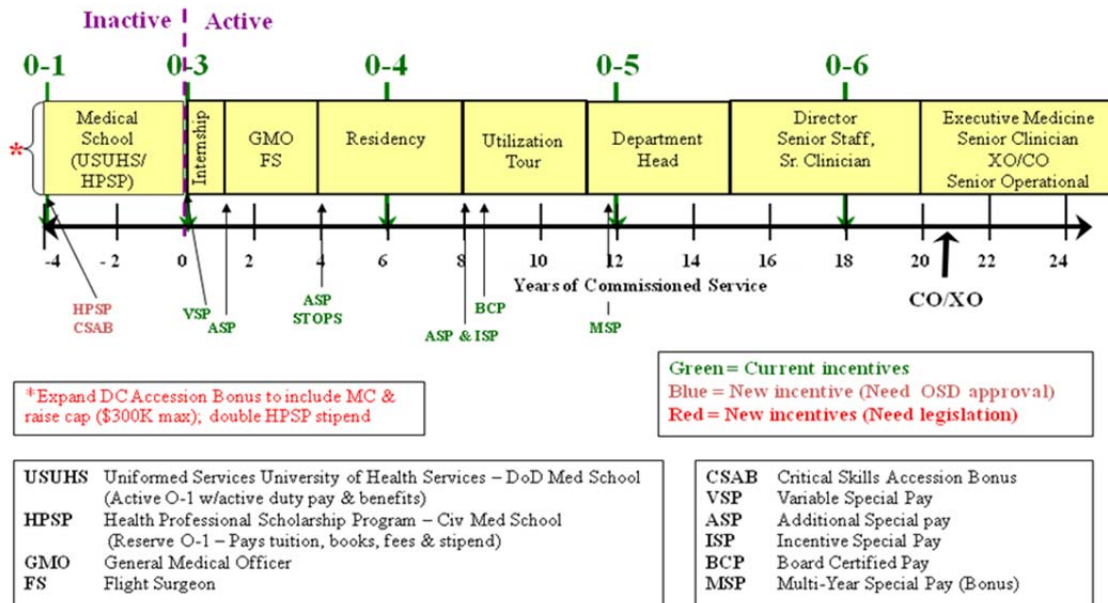


Figure 1. Notional Medical Corps career progression and incentives¹⁶

An individual will enter the service at the grade of O-1 if sponsored financially as a medical student. As shown above, they may be in an AFHPSP status or attending USUHS. Upon completion of medical school they will supersede, or automatically promote, to O-3. At this juncture, a student will begin internship training, followed by a General Medical Officer (GMO) or Flight Surgeon (FS) tour. It is typically at this juncture that an AFHPSP or USUHS student is faced with their first stay/leave decision.

Some medical students will not complete a GMO or FS tour, and they will instead continue on through residency and fellowship training. This is commonly referred to as specialty training. This period of training can last three years or more. The obligated service time for a specialist begins when they complete their training.

¹⁶ “Medical Corps Active Component Community Management,” brief to MC at Bureau of Medicine and Surgery, Washington, D.C., October 2010, slides 10–17.

Figure 1 also depicts when a Navy physician could be eligible for special pays, and at what grade. As mentioned, this is a notional chart, and therefore this progression can vary depending upon the individual and their specialty.

There are five career tracks that an MC officer can take: Clinical, Administrative, Academic, Research, and Operational. This notional progression does not specifically capture each of these tracks; however, such a career transition would typically occur at the Department Head phase. This is shown above, at the grade of O-5, as they become more senior. The opportunities available for promotion and diversification all impact the first stay/leave decision.

While the milestone of residency implies that MC officers should be “residency trained specialists,” this does not mean that all MC officers are expected to meet this milestone. General physicians (those that have not declared a specific specialty), such as GMOs, FSs, and Underwater Medical Officers (UMOs), are an important part of the fabric of the Navy healthcare mission. A general physician is expected to demonstrate career progression by assuming duties within the scope of their practice that shows increased responsibility. General physicians are not eligible for the same special pay options as a board certified specialist, and these factors are all taken into consideration at their first stay/leave decision.¹⁷

F. NAVY RESERVE COMPONENT

This study evaluated the retention rates associated with the Reserve component of the MC. The Navy’s Total Force initiative supports a lifetime of service, and is working to seamlessly integrate the Active and Reserve Components. It is imperative that there is a mutually beneficial relationship and respect among these entities to support the mission, the sailor, and the overall needs of the Navy’s MC community. This is a dynamic transition period that allows the Navy to capture and maintain continuity of service, as well as talent and expertise, in a competitive market.

As the Navy transitions to a “seamless” force, conversion from active duty to reserve status will become the cornerstone of this continuum of service. There are two

¹⁷ “Medical Corps Active Component Community Management,” brief to MC at Bureau of Medicine and Surgery, Washington, D.C., October 2010, slides 10–17.

Navy Administrative Messages (NAVADMINs) that encourage a lifetime of Navy service, and support the rapid and seamless transition from active to reserve status.¹⁸

If a physician chooses to leave active duty service at their first stay/leave decision point (OSD), they are able to transition to reserve status. In this manner, the Navy captures their talent, capitalizes on their investment, and improves reserve accessions.

1. What are the Navy Reserves?

The Navy Reserve provides support to the Active Duty Component. There are several branches of the Navy Reserve, which can best be explained with the following chart. Figure 2 depicts each of the Reserve Component elements.

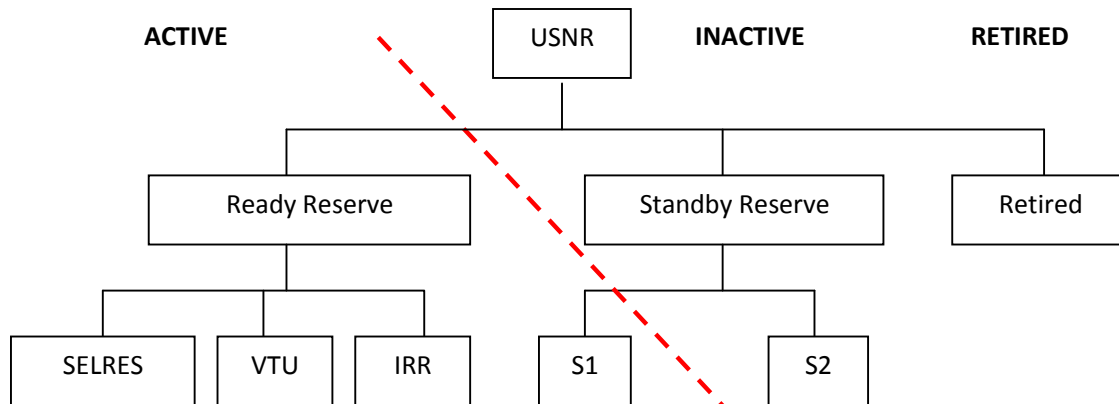


Figure 2. Reserve Component elements

Each member of the Navy Reserve who is not currently serving on active duty is placed in one of three categories: Ready Reserve, Standby Reserve (Active S1 or Inactive S2), or Retired. The first two categories are of greatest interest to the reservist. Members in the Ready Reserve (USNR-R) and Standby Reserve Active (USNR-S1) are considered to be in an “active” status. Members in the Standby Reserve Inactive

¹⁸ A Navy Administrative Message (NAVADMIN) is an administrative message released to inform service members of new policies, policy updates, or changes.

(USNR-S2) are considered to be in an “inactive” status. Everyone in “active” status is eligible to train with or without pay, serve on active duty for training, earn retirement points, and is considered for promotion.¹⁹

NAVETs are individuals who have received a commission as a Naval officer and are released from active duty (RAD), having completed their obligatory time. If a NAVET holds a “USNR” commission, the member is “released” from active duty and transferred to the Individual Ready Reserve (IRR). The member will remain a commissioned naval officer until a written request to “resign” the commission is submitted to the Bureau of Personnel (BUPERS). An officer’s commission will not expire unless it is determined there is career inactivity in a reserve status, at which time the member is processed out of the Navy with an honorable discharge.

“USN” commissioned officers that are “separated” from active duty must obtain a new oath of office as a United States Navy Reserve (USNR) officer. If an oath is not administered, the member resigns their commission upon separation.

Officers with remaining service time (all commissions are administered for eight years of service) will automatically be placed in a USNR status. Upon completion of the obligatory eight years, the commission remains active as long as long as the member maintains activity in the reserves.

These definitions are important to the definition of retention in the reserves. For purposes of this study, an individual in an IRR status is not considered retained in the reserves.

G. NAVY HEALTHCARE RETENTION STUDIES

1. Center for Naval Analyses (CNA)

The following summarizes two physician pay and retention studies conducted by the CNA. The first of these studies, from January 2002, is the Navy Specialty Physician Study: Historical Overview, Retention Analysis, and Synopsis of Current Civilian-Sector Practices, and the second, dated March 2002, is the Health Professions’ Retention-

¹⁹ Tom McAtee, “Information Track For New Naval Reservists,” *Naval Reserve Association News* 52, no. 2 (2005): 11–22.

Accession Incentives Study Report to Congress (Phases II & III: Adequacy of Special Pays and Bonuses for Medical Officers and Selected Other Health Care Professionals).

a. Navy Specialty Physician Study: Historical Overview, Retention Analysis, and Synopsis of Current Civilian-Sector Practices

The recommendations from this study form the foundation for this research. The Navy Surgeon General asked CNA to develop “critical indicators” to track specific retention trends within the MC. CNA quantified an improved index by measuring retention at the physician’s first opportunity to leave the Navy, or more commonly referred to as “end of initial active duty obligation.”²⁰ This stay/leave decision point will be used to define retention in our study.

Analysts continually assess the plans and policies that pertain to recruiting and retaining personnel. Our research will be similar to this CNA study; however, it will examine how life-cycle costs influence policies and plans. This would indicate whether manning shortfalls are related to retention issues, or if they are the result of an insufficient number of physicians being recruited in the training pipeline because of funding issues. The training pipeline refers to those individuals attending medical school (AFHPSP program or attending USUHS) and all physicians in specialty training. The time it takes to “grow” a physician impacts the planning process, and may have been a recruitment planning decision that took place over 11 years ago, depending upon the specialty.

The data were obtained from the Bureau of Medicine and Surgery Manpower Information System (BUMIS), and consisted of the population of physicians on active duty for FYs ‘87 through ‘00. It evaluated notable personnel trends within major physician specialties, examined accessions and attrition rates within the AFHPSP and USUHS programs, and explored some of the trends within the civilian sector.

²⁰ Eric Christensen et al., *Navy Specialty Physician Study: Historical Overview, Retention Analysis, and Synopsis of Current Civilian-Sector Practices* (Alexandria, VA: Center for Naval Analyses [CNA], January 2002). Last accessed October 2, 2001, <http://www.cna.org/research>, archive locator: CRM D0004916, 7.

They found that “overall the MC became 3 percent smaller over the last decade, while the number of full trained specialists increased by 16 percent.”²¹ Yet “trends show the number of active duty physicians placed in the GME training pipeline declined 35 percent.”²² These results suggest that this dramatic GME reduction could “impede the Navy’s ability to fill billets in the future (depending on how the number of billets changes over time).”²³ Our study will look at data from FY ‘96 through FY ‘06 to determine how similar downsizing trends impacted recruitment, the training pipeline, and the force structure of the MC. It will also consider the impact of a dramatic economic crisis and the start of armed conflict in March 2003.

Finally, the analyses of the AFHPSP and USUHS programs illustrated a decline in retention since April 1988, when the Navy changed its policy with respect to obligations associated with GME training. This was an area that warranted future research.²⁴

Additionally, and most notably, CNA strongly recommended that a study be conducted to determine “required retention rates by specialty,” and to “evaluate the cost of accessions with the cost of increasing retention by paying higher wages.”²⁵ In conjunction with the retention rates study, an examination of how life-cycle costs vary by accession source would help to “compare the cost of meeting the desired expected profile of the medical corps through different accession sources to find the optimal accession source mix.”²⁶ This research will focus specifically on this recommendation, and will examine current cost data provided by Navy Medicine Manpower, Personnel, Education, and Training Command (NAVMED MPTE).

²¹ Eric Christensen et al., *Navy Specialty Physician Study: Historical Overview, Retention Analysis, and Synopsis of Current Civilian-Sector Practices* (Alexandria, VA: Center for Naval Analyses [CNA], January 2002). Last accessed October 2, 2001, <http://www.cna.org/research>, archive locator: CRM D0004916, 2.

²² Ibid., 3.

²³ Ibid.

²⁴ Ibid.

²⁵ Ibid., 5.

²⁶ Ibid., 5.

b. Health Professions' Retention-Accession Incentives Study Report to Congress (Phases II & III: Adequacy of Special Pays and Bonuses for Medical Officers and Selected Other Health Care Professionals)

CNA completed a comprehensive examination of the Military Health System's (MHS) health professions force structure and compensation plans in 2002. It considers the Navy, Army, and Air Force; however, for purposes of our research, the discussion will only pertain to the Navy findings and recommendations.

The CNA study examines whether or not uniformed health care professionals are being adequately compensated. CNA took a three-phase approach to answering this question. During phase one, analysts conducted a comparative analysis of compensation between uniformed and private sector health care professionals to determine if a pay gap existed. Phases two and three examined retention and accession trends for specific specialties (the study included 23) as they related to the authorized billets and inventory.²⁷

In phase one, the pay gap analysis included physicians at their first stay-leave decision point. CNA aptly states that is important for decision makers to understand the accession sources for physicians, and the military obligations associated with those programs. The accession source dictates the career path and time in service, which influence a physicians' stay-leave decision.

Table 1 illustrates the specialists considered in the CNA study, and the number of years of service at the specialists' first stay-leave decision point. This snapshot illustrates the differences in training timelines.²⁸

²⁷ Shayne Brannan et al., *Health Professions' Retention-Accession Incentives Study Report to Congress (Phases II & III: Adequacy of Special Pays and Bonuses for Medical Officers and Selected Other Health Care Professionals)* (Alexandria, VA: Center for Naval Analyses [CNA], March 2002). Last accessed October 2, 2001, <http://www.cna.org/research>. CRM D0004460.A5, 39.

²⁸ Ibid., 40.

Table 1. MHS physician career profiles²⁹

Table 6. Predominant MHS physician career profile
(based on 4-year AFHPSP direct accession)

Specialty	Program length (years)	First stay-leave decision point (years of service)
Anesthesiology	4	8
Cardiology	6	11
Dermatology	4	8
Emergency medicine	4	8
Family practice	3	7
Gastroenterology	6	12
General surgery	5	9
Hematology/oncology	6	11
Internal medicine	3	7
Neurology	4	8
Neurosurgery	7	13
Obstetrics/gynecology	4	8
Preventive medicine/ occupational health	3	7
Ophthalmology	4	8
Orthopedic surgery	5	9
Otolaryngology	6	12
Pathology	5	12
Pediatric	3	7
Physical medicine	4	7
Plastic reconstructive	5	13
Psychiatry	4	8
Radiology	5	9
Urology	6	11

²⁹ Shayne Brannan et al., *Health Professions' Retention-Accession Incentives Study Report to Congress (Phases II & III: Adequacy of Special Pays and Bonuses for Medical Officers and Selected Other Health Care Professionals)* (Alexandria, VA: Center for Naval Analyses [CNA], March 2002). Last accessed October 2, 2001, <http://www.cna.org/research>. CRM D0004460.A5, 40.

Considering physicians can retire when they reach 20 years of service, the time in training added to the time in service becomes a critical part of the decision-making process. These results did not consider FAP because data were not available. The analysis being conducted for this research will consider FAP and USUHS, and how those programs relate to inventory and retention. In this CNA study, analysts did note that the USUHS students were more likely to remain in the military until retirement because they likely have prior enlisted or commissioned service before entering USUHS. All time in service counts toward retirement years.³⁰

Military physicians that transition to a civilian career must consider benefits offered in a total compensation package from potential civilian employers. There are non-quantifiable differences in the nature of their work that can significantly impact the decision to leave. These include unique factors such as likelihood of deployment, family stability, type and quality of medical equipment and facilities, and continuing medical education (CME) opportunities, to name a few.³¹ The study found that a “uniformed-civilian pay gap exists at every career junction for all specialties considered.”³²

Interestingly, in 1999, the Congressional Budget Office (CBO) published a report titled “What Does the Military ‘Pay Gap’ Mean?”

Both areas—benefits and conditions of work—have features that might tend to make the military look particularly attractive, at least to some people, and other features that could tend to make the military service look unattractive. If the attractive features predominate, the military might be able to offer lower pay than civilian employers; if the unattractive features predominate, DoD might have to pay a premium to meet its personnel needs.³³

³⁰ Shayne Brannan et al., *Health Professions’ Retention-Accession Incentives Study Report to Congress (Phases II & III: Adequacy of Special Pays and Bonuses for Medical Officers and Selected Other Health Care Professionals)* (Alexandria, VA: Center for Naval Analyses [CNA], March 2002). Last accessed October 2, 2001, <http://www.cna.org/research>. CRM D0004460.A5, 3.

³¹ Ibid., 2.

³² Ibid., 37.

³³ Ibid., 3.

This is extremely important because it unequivocally states that the mere existence of a pay gap does not ascertain if pay affects retention. This suggests that monetary incentives would be negligible. Our study will therefore not examine special pays and their impact on retention. We will examine how life-cycle costs of each of the Navy's accession programs impacts recruitment policies.

2. Military Health System (MHS)

It is strategically imperative that the MHS meet its workforce objectives. These include force structure, pay grade structure, billet authorizations, readiness requirements, experience, retention, and the effect of pay on retention. These factors are all considered, in conjunction with the adequacy of existing pay and accession bonuses, during the personnel planning process.³⁴

CNA suggests that it may not be enough to only imply causality to the pay gap, and it is equally valuable to discuss how the MHS establishes its priorities. Ultimately, they argue, the direction of the MHS dictates how we access and retain physicians. Sometimes the decisions pertaining to the direction of the Navy's MC has little to do with pay gap issues, and more to do with size of the force and Congressional budget constraints that affect end strength numbers. Either way, policy makers must take these decisions into consideration when designing scholarship programs, loan forgiveness programs, and the special pay system for total physician compensation.

Each of these programs has seen fluctuations in accession and retention figures, which significantly impacts the training pipeline for physicians. As discussed, new accessions are "deferred" and may not be able to practice medicine for the Navy as a licensed general practitioner or board certified specialist for many years because they are training. These "deferred" individuals change the inventory, especially as accession numbers change with each FY.

³⁴ Shayne Brannan et al., *Health Professions' Retention-Accession Incentives Study Report to Congress (Phases II & III: Adequacy of Special Pays and Bonuses for Medical Officers and Selected Other Health Care Professionals)*. (Alexandria, VA: Center for Naval Analyses [CNA], March 2002). Last accessed October 2, 2001, <http://www.cna.org/research>. CRM D0004460.A5, 38.

The MHS has undergone various transformations and began to stabilize in the late 1990s. Historically, the services were able to easily access medical professionals into the procurement pipeline. They competed fiercely with generous signing bonuses, medical school debt relief assistance, and tailored benefit packages. These expensive accession programs do not always account for the complexities in the planning process, and CNA found that “DoD was unable to establish a reliable and consistent accession source,” and “often overemphasized the importance of the military-civilian pay gap . . . by initiating a wide array of special pay programs.”³⁵ To help simplify the process, CNA recommends streamlining the special pay system to fewer categories. These would be adjusted for inflation, and would provide greater flexibility to invoke or suppress initiatives needed to achieve desired workforce objectives.³⁶ These options specifically included an increase to entitlement special pays, to increase caps on discretionary special pays, granting accession bonus authority to fully qualified specialists, indexing entitlement special pays (increasing ASP, VSP, and BCP annually at the rate of Regular Military Compensation (RMC), and offering a critical skills retention bonus (CSRB).

In conjunction with these findings, one of the most striking changes to the MHS was the deliberate downsizing of the force. Table 2 captures the total MHS inventory from FY ‘91 through FY ‘00. The inventory reduction suggests that losses may not be a retention problem related to a military-civilian pay gap, but rather a conscious business decision. Nonetheless, these decisions all negatively impacted the training and accession pipelines for physicians. The effects of those decisions are still being felt today, as will be revealed in the discussion section of this research.³⁷

³⁵ Shayne Brannan et al., *Health Professions’ Retention-Accession Incentives Study Report to Congress (Phases II & III: Adequacy of Special Pays and Bonuses for Medical Officers and Selected Other Health Care Professionals)* (Alexandria, VA: Center for Naval Analyses [CNA], March 2002). Last accessed October 2, 2001, <http://www.cna.org/research>. CRM D0004460.A5, 7.

³⁶ Ibid., 9.

³⁷ Ibid., 43.

Table 2. MHS MC inventory³⁸

Table 7. MHS medical corps inventory, by Service (FY 1991-2000)^a

Service	FY91	FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99	FY00
Army	5,606	5,512	5,358	5,036	4,848	4,775	4,528	4,420	4,295	4,168
Navy	4,351	4,385	4,401	4,351	4,115	4,096	4,026	4,036	4,031	4,004
Air Force	4,267	4,379	4,300	4,238	4,214	4,180	4,118	4,092	3,940	3,882
MHS Total	14,224	14,276	14,059	13,625	13,177	13,051	12,672	12,548	12,266	12,054

By FY '00, MHS inventory had dropped by 15% from FY '91.³⁹

CNA compared the inventories, by specialty, to future manning and readiness requirements, and concluded that, in most cases, the Navy met its readiness requirements. Anesthesiology, plastic surgery, and general surgery were the exceptions. In all cases, CNA recommended bringing more physicians into the training pipeline or acquiring more specialists through FAP. This research will evaluate the effectiveness of the Navy's FAP program. Another recommendation was to either improve retention or decrease attrition. The aforementioned options pertaining to special pays would address those recommendations, and will be examined in this research.⁴⁰

Figure 3 captures the descriptive statistics for attrition rates from FY '91 through FY '98. This is valuable because it shows attrition as relatively constant until FY '98,

³⁸ Shayne Brannan et al., *Health Professions' Retention-Accession Incentives Study Report to Congress (Phases II & III: Adequacy of Special Pays and Bonuses for Medical Officers and Selected Other Health Care Professionals)*. (Alexandria, VA: Center for Naval Analyses [CNA], March 2002). Last accessed October 2, 2001, <http://www.cna.org/research>. CRM D0004460.A5, 43.

³⁹ Ibid., 42.

⁴⁰ Ibid., 62.

and we can compare this statistic to those found in our analysis of current FY trends in light of a protracted war and economic downturn.⁴¹

Figure 6. Attrition rates for 23 physician specialties, FY 1991-1998

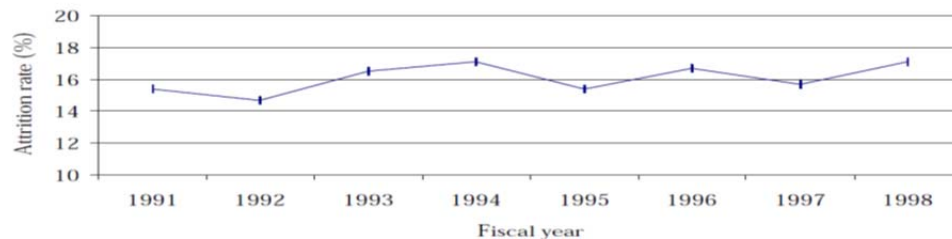


Figure 3. Model attrition rates for FYs '91-'98⁴²

A duration model was used to determine if the military-civilian pay gap was correlated with whether a physician stays or leaves the Navy at a higher rate at any given time t , given that the physician has been unobligated for a defined period of time leading up to time t . In statistical literature this is known as the hazard rate, and in the context of this study it is known as the attrition rate of unobligated physicians.⁴³ This proved inconclusive because the initial OSD field was missing in the database from Defense Manpower Data Center (DMDC).

We will not be using a duration model; however, the BUMIS data contains this required field, and we will be able to analyze this relationship. We expect that a pay gap will exist, but this will prove inconsequential to this research, as we will be focused upon how life-cycle costs impact retention.

The second model compared initial Active Duty Obligations (ADOs) by specialty over five FYs. In the aggregate, it showed that short-term retention had a positive and significant effect on AFHPSP and USUHS students. We will reexamine BUMIS data for current cohorts that have served during an economic downturn and protracted war.

⁴¹ Shayne Brannan et al., *Health Professions' Retention-Accession Incentives Study Report to Congress (Phases II & III: Adequacy of Special Pays and Bonuses for Medical Officers and Selected Other Health Care Professionals)* (Alexandria, VA: Center for Naval Analyses [CNA], March 2002). Last accessed October 2, 2001, <http://www.cna.org/research>. CRM D0004460.A5, 42.

⁴² Ibid., 42.

⁴³ Ibid., 62.

a. *General Accounting Office: Military Personnel: Status of Accession, Retention, and End Strength for Military Medical Officers and Preliminary Observations Regarding Accession and Retention Challenges, April 2009*

The Senate Armed Services Committee (SASC) report accompanying the National Defense Authorization Act for FY '09 directed the Comptroller General to report by April 1, 2009, to the congressional defense committees on a study of medical and dental personnel requirements for the Army, Navy, and Air Force, including their reserve components, to meet their medical missions. More specifically, they were tasked with examining recruitment and retention goals. The objectives of this report were inclusive:

- How is DoD organized to recruit medical students and access medical officers across the military services?
- To what extent did the Active and Reserve components meet their annual accession goals for medical officers in FYs '01 through '08?
- To what extent did the Active and Reserve components retain medical officers in FYs '01 through '08?
- To what extent did the Active and Reserve components meet their annual authorizations for medical officers in FYs '01 through '08?
- What challenges, if any, have the military services faced in their accession and retention of medical officers, and what plans have they developed to address those challenges?⁴⁴

Our research will look at specific retention percentages for accession programs, but it will also look at which factors were significant and which factors affected those rates. Our research did not adequately address specific plans; however, it will discuss cost estimation issues pertaining to accession plans. Our research will also look at how those figures are factored into policy development.

⁴⁴ General Accounting Office, *Military Personnel: Status of Accession, Retention, and End Strength for Military Medical Officers and Preliminary Observations Regarding Accession and Retention Challenges*, GAO-09-469R Military Personnel (Washington, D.C., April 16, 2009), Briefing to Congressional Committees.

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III. DATA AND METHODOLOGY

A. ACTIVE COMPONENT DATA

This chapter describes the data, variables, and methodology used to analyze the effects of accession source on retention for active duty MC officers. The primary data used for this study was obtained from the MC Career Planning Office at the BUMED. The data were separated by cohort based on the year of entry into the active duty MC. The data included information for 3,864 physicians who joined the Navy between FY '96 and '06. The data included date of entry, end of initial military OSD, as well as demographic information such as gender and ethnicity. The cohort datasets were then merged with Navy Recruiting Command (NRC) data to obtain the state the physician was recruited from, Grade Point Average (GPA), specialty code, and marital status.

The merged datasets provide the following variables for the multivariate probit regression model used in this study.

1. Dependent Variable

a. Retention

“Retained 1-Year” is used as the dependent variable for the model. It is defined as a member staying a minimum of one year beyond the expiration of their original MSO. This is a binary variable taking a value of 1 if the member was retained, and 0 otherwise. Those members who had not yet reached the end of their first OSD and those who were still on active duty, but had not yet reached one year past their service obligation, were excluded. Table 3 illustrates this breakdown.

Table 3. Dependent variable characteristics

Retention Status	Number of Observations	Percentage
Retained One Year	2,535	65.61
Not Retained One Year	1,329	34.39

2. Explanatory Variables

a. Accession Year

“Accession Year” is defined as the year that a licensed physician begins their commissioned service. A binary variable was created for each FY from ‘96 through ‘06, with 1 annotating service beginning during that year. Table 3 shows the characteristics of the merged dataset for the FY of accession. BUMED provided data from FYs ‘96 through ‘10. FY ‘06 was the last year that the majority of accessions had time to reach the end of their OSD, also referred to as the completion of MSO. Anyone accessed after FY ‘06 was excluded from the study because they did not have enough time in service to complete their MSO.

Table 4 shows the percentage of accessions broken down by cohort year. There is a steady downward trend in accessions beginning in FY ‘01 through FY ‘06, likely due to changes in accession goals and recruiting environment. The low point for accessions is FY ‘05. From FY ‘05 through ‘06 there is a marked increase in the percent retained. The Navy released a new special pay instruction, Office of the Chief of Naval Operations, OPNAV Instruction 7220.17, in 2005, which outlines the special pay policy for the MC, Dental Corps, Medical Service Corps, and Nurse Corps Officers. This policy update may account for the upward trend in retention from FY ‘05 through ‘06. Another likely cause could be the state of the economy, coupled with the ongoing Iraq war.

Table 4. Cohort data characteristics

Cohort Year	Number Accessed	Number Reaching End of First Service Obligation (OSD)	Percentage Retained (One Year Past OSD)
1996	331	331	71
1997	376	376	66
1998	408	408	67
1999	411	411	64
2000	402	401	60
2001	395	303	64
2002	366	364	65
2003	333	330	64
2004	339	332	65
2005	296	287	73
2006	332	292	74

b. Program of Entry

Table 5 illustrates “Program of Entry,” and is divided into five variables: HPSP, NADDS, NADDS 1-Year Delay, USUHS, and Other. A binary variable is created for each variable with 1 being recruited through the variable name program, and 0 otherwise.

Table 5. Recruitment program variables

Program of Entry	Number of Observations	Percentage
HPSP	2,214	57.30
NADDS	470	12.16
NADDS 1-Year Delay	250	6.50
USUHS	514	13.31
Other	202	5.23

HPSP creates a pipeline of potential Navy physicians who will access onto active duty upon the successful completion of medical school. Additionally, it accounts for more than half of all physician accessions.

USUHS is a triservice medical school, with limited accessions per year. The maximum authorized accessions are typically limited to 51 students per year, which is approximately 15%–20% of the total medical accessions each year. It is the most common medical school for prior service medical students. Time at USUHS counts toward total time in service, and is creditable toward retirement. Prior service USUHS physicians often complete 20 years of service long before their civilian counterparts.

The “Other” variable includes those recruited through the DA program and those recalled to active duty. The “1-Year Delay” variable accounts for physicians completing an additional year of training immediately following completion of civilian medical school. This delays their entry into active duty by one year. Reserve officers are those recalled to active duty, and usually to undermanned specialties. The recall program is used as a valve to complement student programs.

3. Demographic Variables

Demographic variables included gender, race, and ethnicity, region recruited from, prior service status, and marital status at time of entry in the service.

a. Recruit Region

For the purposes of the study we divided the states into seven regions. Some states had too few recruits to generate statistically significant results, thus the reason we aggregate the states into recruit regions. The New England region includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. The Mid-Atlantic region is comprised of Delaware, Maryland, New Jersey, New York, Pennsylvania, and Washington, D.C. The South region includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. The Mid-West region includes Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. The Southwest region includes Arizona, New Mexico, Oklahoma, and Texas. The West region is comprised of Alaska, Colorado, California, Hawaii, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming. The variable “Region Unknown”

was used for those observations that were listed as unknown. Recruits from Puerto Rico were included in “unknown” because the sample size was too small.

Table 6 shows that the South and Mid-West have the highest number of accessions, which matches historical data from Navy recruiting.

Table 6. Recruit region

Region Recruited From	Percentage
New England	5.05
South	20.52
Mid-Atlantic	15.35
Mid-West	20.29
Southwest	4.70
West	15.82
Region Unknown	18.23

b. Prior Service

Prior service is defined as being prior enlisted, a prior commissioned officer, or a warrant officer in any branch of the military. A binary variable is used for each variable. Table 7 shows that only 16.79% of the MC has any prior service experience.

Table 7. Prior service status characteristics

Prior Service Status	Percentage
No Prior Service	83.21
Prior Enlisted	7.85
Prior Officer	8.94

c. Race

The race variable identifies racial background for each of the individuals in this study. Race data showed if the person was Caucasian, Black, Asian, or Pacific Islander. Because of the small number of Pacific Islanders in the data, they were

excluded from the study. Ethnicity data shows if the member was Hispanic or Non-Hispanic. Table 8 shows that these figures reflect a lack of diversity in the MC community.

Table 8. Race, gender, and marital status characteristics

Variable	Number of Observations	Percentage
Caucasian	3,158	81.73
Black	204	5.28
Asian	240	6.21
Other Race	262	6.78
Male	2,815	72.85
Married	807	20.88
Divorced	40	1.05
Single	3,017	78.08

d. Specialists

A physician can specialize in a specific field of medicine such as cardiology, orthopedic surgery or internal medicine, to name a few. The Navy recruits board-certified specialists. The dataset contains information on type of specialty when recruited. The specialty of a Navy physician is an important variable when analyzing retention. Navy specialists are entitled to additional specialty pay and retention bonuses that add to their total compensation. Similarly, the type of specialty is factored into a physicians' earning potential in the civilian workforce. The specialty can affect the likelihood of deployment during times of war, as well as the overall work environment of practicing medicine in the Navy. Ultimately, all of these factors affect a physicians' decision to stay or leave the military.

The dataset does not contain information on specialty bonuses, deployment history, or job satisfaction. Therefore, we include binary variables that capture the specialty held by the physician since bonus pay in the military varies by specialty. We believe that the specialty indicator variable provides a valid proxy for bonuses. Specialists are entitled to special pay and bonuses, and this study assumes those physicians have accepted those monies. This allows us to determine whether the type of

specialty affects retention, capturing elements of each of the aforementioned factors. However, this variable only captures a small percentage of physician specialists when compared to the overall number of accessions for Navy Medicine. Table 9 defines the variables as “general surgery,” “general practitioner,” and “other specialty.” Specialists were too small to be included individually, and were therefore grouped as “other specialty.” This variable includes Aerospace Medicine, Cardiology, Family Practice, Neurology, Orthopedics, Psychiatry, Radiology, and Pediatrics.

Table 9. Specialty groups

Group	Percentage
Other Specialty	6.26
General Surgery	4.44
General Practitioner	89.30

e. Education

The dataset includes educational data on undergraduate major and GPA. The education variable only captures the undergraduate degree at the time of accession. It does not capture advanced degrees because the dataset did not contain medical school information. Binary variables for undergraduate majors are included to determine if this affects the likelihood of retention for MC officers. Data categorizing undergraduate degrees were given for 16 degree fields of study. Binary variables were created for health professions, biology, physical science, psychology, engineering, and other degrees.

GPA is used as an explanatory variable to help determine whether or not the quality of physician recruited has an effect on retention. GPA is the only continuous variable used in this study. Table 10 shows the average GPA for the data set was 3.55, with a maximum of 4.0 and minimum of 2.19.

Table 10. Education

Undergraduate Degree	Percentage
Health Professions	41.94
Biology	37.19
Physical Science	4.86
Psychology	2.33
Engineering	2.68
Other Degree	11.00

B. MODEL SPECIFICATION

A medical officer's decision to stay is affected by several demographic variables that remain constant during his/her career. There are other factors during the span of a career that can change over time, and can be captured. Given the binary nature of the dependent variable, a multivariate probit regression model is most appropriate to estimate the marginal effect of the various independent variables on a medical officer's retention decision probability.

The dependent variable is "retained one-year," and is representative of a medical officers' decision to remain on active duty.

1. Model

The primary model equation is used to estimate the likelihood a medical officer will stay after controlling observable background characteristics.

$$P(\text{attrite} = 1|x) = \Phi(\alpha + \beta_i \text{Accession Source}_i + \gamma_j \text{Specialty}_j + \partial \text{Female} + \zeta_k \text{Region}_k + \theta_l \text{Race}_l + \lambda_m \text{Marital Status}_m + \xi_n \text{Undergraduate Degree}_n + \pi \text{GPA} + \varphi_t \text{Cohort Year}_t + u)$$

2. Minority Model

We estimate a separate model for minorities by restricting the sample only to Caucasian officers. The model investigates the effect of accession source on retention for minorities. The control variables are the same as those specified in the main model.

3. Gender Model (Females Only)

To investigate whether the accession source has a different effect on each gender we also estimate the model by restricting the sample to females, and then again for males.

C. MARKOV MODELS

The aggregate probabilities from this data were used to create Markov models to predict the future end strength of the MC. The Markov model predicts the survivability of physicians based upon accession source. The data contains 11,790 total observations. To forecast the health of the Navy active duty MC, we use the data collected from BUMED. The data contain accession sources for FYs '81 through '10.

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IV. RESULTS

The results of our analysis are presented below. This section only contains statistically significant results. Full estimation results are found in Appendices A through C. We first discuss the probit results. Next, we present the forecasts for survivability of the accession programs using the Markov model.⁴⁵ Finally, we present the life-cycle costs associated across the different accession sources.

A. ACTIVE DUTY RESULTS

1. Probit Analyses

Table 11 provides the multivariate probit regression results for the primary probit model equation. These results provide insight on the likelihood a medical officer is retained one year across different accession sources after controlling for cohort year. The results from Table 11 suggest that USUHS and those in the “other” category were more likely to retain than AFHPSP students. USUHS students were 28% more likely than AFHPSP to be retained one year beyond their OSD. Conversely, NADDs were 48% less likely to be retained one year beyond their OSD. The “Other” category captures Direct Accessions and Recalls, both licensed physician categories. Prior enlisted were shown to be less likely to stay. Both of these results were statistically significant. All results are significant at the 95% confidence level. This coincides with previous discussions pertaining to USUHS students being primarily prior service, and likely to be vested in Navy career. USUHS is “prior service,” which includes both prior officers and enlisted service members. This may account for the contrast to prior enlisted being less likely to stay.

⁴⁵ We also run the same probit models for the Reserve Component; however, we do not present the results because the data were incomplete and unreliable for statistical inference.

Table 11. Primary model results

Primary Model – Regression Results		
Variables	(1) Probit Results	(2) Marginal Effects
USUHS	1.1577*** (0.1438)	0.2894*** (0.0208)
NADDS	-1.3105*** (0.0853)	-0.4870*** (0.0282)
NADDS_1_YR	-0.7736*** (0.1043)	-0.2962*** (0.0404)
FAP	-0.7290*** (0.1118)	-0.2793*** (0.0436)
OTHER	0.2225* (0.1242)	0.0733* (0.0384)
female	0.0547 (0.0648)	0.0189 (0.0223)
Asian	-0.0006 (0.1163)	-0.0002 (0.0406)
Black	0.0670 (0.1277)	0.0230 (0.0431)
other_race	-0.8332*** (0.1475)	-0.3198*** (0.0565)
prior_enlisted	-1.9582*** (0.4391)	-0.6500*** (0.0838)

Table 12 shows the results when evaluating the effect of accession source on retention for minorities only. Minorities are those accessions listed as Black, Asian, or Other race. When compared to AFHPSP, USUHS is the only accession source that reveals positive and significant results. Among minorities, Blacks are the only group that is more likely to be retained.

Table 12. Minority model results

Minority Model – Regression Results		
Variables	(1) Probit Results	(2) Marginal Effects
USUHS	1.2865*** (0.3666)	0.4055*** (0.0710)
NADDS	-1.3348*** (0.2347)	-0.4810*** (0.0658)
NADDS_1_YR	-0.8762*** (0.2506)	-0.3272*** (0.0798)
FAP	-0.3610 (0.2814)	-0.1430 (0.1092)
OTHER	0.2189 (0.3135)	0.0856 (0.1199)
female	-0.0723 (0.1637)	-0.0288 (0.0651)
Asian	0.8556*** (0.2306)	0.3258*** (0.0818)
Black	1.0652*** (0.2249)	0.3887*** (0.0715)

Table 13 shows the results when evaluating the effect of different accession sources on retention for the female and male samples. For both females and males, only USUHS has a positive effect on retention when compared to AFHPSP. The probability of a male student at USUHS being retained is 15% higher when compared to females. Additionally, the “Other race” variable has a negative effect on retention for both females and males. All results are statistically significant.

Table 13. Gender model results

Females Only – Regression Results		
Variables	(1) Probit Results	(2) Marginal Effects
USUHS	1.0072*** (0.2673)	0.2873*** (0.0499)
NADDS	-1.3944*** (0.1622)	-0.5138*** (0.0496)
NADDS_1_YR	-0.9982*** (0.1897)	-0.3823*** (0.0668)
FAP	-0.6112** (0.2556)	-0.2381** (0.1000)
OTHER	-0.0359 (0.2969)	-0.0132 (0.1104)
Asian	-0.2032 (0.2403)	-0.0769 (0.0932)
Black	-0.0759 (0.1924)	-0.0282 (0.0722)
other_race	-1.1587*** (0.3206)	-0.4354*** (0.1017)
Males Only – Regression Results		
Variables	(1) Probit Results	(2) Marginal Effects
USUHS	1.1597*** (0.1439)	0.2896*** (0.0207)
NADDS	-1.3082*** (0.0852)	-0.4862*** (0.0282)
NADDS_1_YR	-0.7705*** (0.1043)	-0.2950*** (0.0404)
FAP	-0.7337*** (0.1116)	-0.2811*** (0.0435)
OTHER	0.2158* (0.1240)	0.0712* (0.0385)
Asian	-0.0020 (0.1163)	-0.0007 (0.0406)
Black	0.0801 (0.1268)	0.0274 (0.0425)
other_race	-0.8341*** (0.1475)	-0.3201*** (0.0564)
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

B. MARKOV MODELS

We carried over the multivariate probit regression model results into a Markov Model to predict the survivability of accessions by program until 20 years of service. These figures are estimated for those accessed beginning in FY '96 and are carried through for all accessions until FY '10.

The Markov model uses the retention probabilities estimated via the probit model and the continuation rates contained in the BUMED dataset. The probability of years of service is calculated per accession source to predict numbers of years served for each FY by cohort.

Table 14 is consistent with the multivariate probit regression results. It shows that USUHS has the highest probability of a physician serving 20 years, at 0.41. While USUHS has a high survivability probability at 10 years, it drops significantly at the 20-year mark. The probability of a physician from USUHS serving 10 years is 0.95. Again, this is consistent with previous results and recognizes the fact that a USUHS physician will likely have prior service time, and was eligible for retirement prior to serving 20 years as physician. Table 15 shows that the probability of a physician from AFHPSP serving 10 years is 0.46.

Table 14. USUHS continuation table

Fiscal Year	Probability of Retention	1	1	1	1	0.99	0.99	0.98	0.98	0.96	0.95	0.93	0.85	0.75	0.65	0.58	0.5	0.48	0.46	0.4	0.41
	Number Accessed																				
1996	48	48	48	48	48	48	48	47	47	46	46	45	41	36	31	28	25	23	22	21	20
1997	48	48	48	48	48	48	48	47	47	46	46	45	41	36	31	28	25	23	22	21	20
1998	48	48	48	48	48	48	48	47	47	46	46	45	41	36	31	28	25	23	22	21	20
1999	50	50	50	50	50	50	50	49	49	48	48	47	43	38	33	29	27	24	23	22	21
2000	51	51	51	51	51	50	50	50	50	49	48	47	43	38	33	30	27	24	23	22	21
2001	43	43	43	43	43	43	43	42	42	41	41	40	37	32	28	25	23	21	20	18	18
2002	49	49	49	49	49	49	49	48	48	47	47	46	42	37	32	28	26	24	23	21	20
2003	48	48	48	48	48	48	48	47	47	46	46	45	41	36	31	28	25	23	22	21	20
2004	43	43	43	43	43	43	43	42	42	41	41	40	37	32	28	25	23	21	20	18	18
2005	47	47	47	47	47	47	47	46	46	45	45	44	40	35	31	27	25	23	22	20	19
2006	38	38	38	38	38	38	38	37	37	36	36	35	32	29	25	22	20	18	17	16	16
2007	47	47	47	47	47	47	47	46	46	45	45	44	40	35	31	27	25	23	22	20	19
2008	47	47	47	47	47	47	47	46	46	45	45	44	40	35	31	27	25	23	22	20	19
2009	45	45	45	45	45	45	45	44	44	43	43	42	38	34	29	26	24	22	21	19	18
2010	47	47	47	47	47	47	47	46	46	45	45	44	40	35	31	27	25	23	22	20	19
Years of Service		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Table 15. AFHPSP continuation table

	Probability of Retention	1	0.99	0.98	0.96	0.91	0.78	0.7	0.64	0.54	0.46	0.38	0.32	0.27	0.24	0.22	0.2	0.19	0.19	0.18	0.18
Fiscal Year	Number Accessed																				
1996	188	188	186	184	180	171	147	132	120	102	86	71	60	51	45	41	38	36	36	34	34
1997	208	208	206	204	200	189	162	146	133	112	96	79	67	56	50	46	42	40	40	37	37
1998	224	224	222	220	215	204	175	157	143	121	103	85	72	60	54	49	45	43	43	40	40
1999	209	209	207	205	201	190	163	146	134	113	96	79	67	56	50	46	42	40	40	38	38
2000	200	200	198	196	192	182	156	140	128	108	92	76	64	54	48	44	40	38	38	36	36
2001	221	221	219	217	212	201	172	155	141	119	102	84	71	60	53	49	44	42	42	40	40
2002	204	204	202	200	196	186	159	143	131	110	94	78	65	55	49	45	41	39	39	37	37
2003	210	210	208	206	202	191	164	147	134	113	97	80	67	57	50	46	42	40	40	38	38
2004	207	207	205	203	199	188	161	145	132	112	95	79	66	56	50	46	41	39	39	37	37
2005	199	199	197	195	191	181	155	139	127	107	92	76	64	54	48	44	40	38	38	36	36
2006	213	213	211	209	204	194	166	149	136	115	98	81	68	58	51	47	43	40	40	38	38
2007	201	201	199	197	193	183	157	141	129	109	92	76	64	54	48	44	40	38	38	36	36
2008	208	208	206	204	200	189	162	146	133	112	96	79	67	56	50	46	42	40	40	37	37
2009	173	173	171	170	166	157	135	121	111	93	80	66	55	47	42	38	35	33	33	31	31
2010	174	174	172	171	167	158	136	122	111	94	80	66	56	47	42	38	35	33	33	31	31
Years of Service		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Only USUHS and AFHPSP have a probability greater than 0.30 of reaching 10 years of service. For all accessions programs, with the exception of USUHS and AFHPSP, the highest percentage of physicians leaving the Navy is between 5 and 10 years of service. For USUHS and AFHPSP, it is between the 10- and 15-year point.⁴⁶

C. COST ANALYSIS

Based on cost estimation data received from NAVMED MPTE, we were able to calculate the average cost by accession program for FY ‘10. Cost data were provided for only AFHPSP, FAP, and those programs contained in the “Other” category.

Using continuation Tables 14 and 15, we took the number of accessions and forecasted career continuation probabilities to the 5-year and 10-year point in a physicians’ career for each program. We then multiplied these accessions by the years of service to obtain the total years of available service. Ten years would represent the career midpoint, and 20 would represent a full 20-year career as a Navy physician. We chose

⁴⁶ Additional continuation tables for all accession programs can be found in Appendices D through G. This discussion is limited to USUHS and AFHPSP, the two accession programs with the highest probability for retaining Navy physicians.

5 and 10 years to analyze, as these years represent critical decision-making juncture points, both when developing accession policies and within a physician's career.

Table 16 shows that for 174 AFHPSP accessions, at 10 years of service this would yield 1,740 total years of available service. We then took the total program cost and divided it by actual years served. Program costs were provided by NAVMED MPTE. Actual years served equals the sum of the "predicted" number of physicians from year 1 through year 10, as represented on the continuation tables. For AFHPSP (Table 16), the sum of the predicted number of physicians serving is 1,385. The total cost is then divided by the predicted years served to obtain the accession cost per year by program. Table 17 displays similar results for officers at the 5-year point in a physician's career.

Table 16. Accession cost of year served at career midpoint

Program	Number of Accessions	Total Cost	Total Years Available (at 10 years)	Predicted Years Served (from continuation tables)	Accession Cost per Year of Service	Percentage of Years Served
AFHPSP	174	\$45,686,588	1,740	1,385	\$32,986.70	79
FAP	17	\$3,111,778	170	112	\$27,783.72	65
OTHER	22	\$580,444	220	139	\$4,175.58	63

Table 17. Accession cost of year served at five years

Program	Number of Accessions	Total Cost	Total Years Available (at 5 Years)	Predicted Years Served (from continuation tables)	Accession Cost per Year of Service	Percentage of Years Served
AFHPSP	174	\$45,686,588	870	842	\$54,259.60	97
FAP	17	\$3,111,778	85	74	\$42,051.05	87
OTHER	22	\$580,444	110	93	\$6,241.33	85

From this data, you can calculate the percentage of years served by comparing total years available to predicted values. AFHPSP students serve 79% of the years available at year 10.

When compared to “Other,” AFHPSP accessions served 16% more of the years available at 12% higher costs. “Other” and FAP accessions are cheaper in the short term; however, when you extend the model out to 10 years, AFHPSP gains value. For total years served, AFHPSP provides more value long term.

Policy makers need to determine whether short-term accessions or long-term retention are more valued.

V. CONCLUSIONS

A. SUMMARY

Retention is an important facet in the manning of the MC, and it has a significant impact on the ability to meet the Navy medical mission. This study evaluates how effectively the different accession programs in the MC community retain physicians. The Navy has various accession programs aimed at recruiting physicians at different points in their training. We analyze the retention rates for each of the Navy's MC accession programs at the physicians' first stay/leave decision point, otherwise referred to as the end of OSD. A physician can leave the Navy at this point, and will have gained invaluable hands-on training and leadership experience. This study examines several accession programs to determine if they are serving their intended purpose, and if they are having a positive impact on retention. Additionally, this study looks at the life-cycle costs of BUMED accession programs.

B. CONCLUSIONS

Using a multivariate probit regression we analyze the effect of different accession sources on a medical officer being retained one year beyond the end of service obligation. This analysis is important because it shows that the Navy is losing the largest percentage of their MC officers between 5 and 10 years of service. If we increase accessions to programs where officers have a lower probability of being retained, then, over the long term, the Navy will see manning shortages in the force structure of the MC. Additionally, it is more cost-effective to recruit people to programs with a higher rate of retention, than utilizing retention bonuses to compensate for retention rates.

Our results suggest that officers coming through USUHS and those in the "Other" category are more likely to retain when compared to AFHPSP. Among minorities, Blacks are the only group that is more likely to retain. Among females, only USUHS has a positive effect on retention when compared to AFHPSP. This may result from prior service knowledge and experience influencing their decision to stay in the Navy. Males show the same result, with even stronger probability toward retention. Additionally, the

“Other race” variable has a negative effect on retention. Prior enlisted were shown to retain at lower rates. This may be attributed to the lifestyle changes they encounter when transitioning from the enlisted ranks to the officer community. All aforementioned results were significant.

The Markov models show that for all accessions programs, with exception of USUHS and AFHPSP, the highest percentage of physicians leaving the Navy occurs between 5 and 10 years of service. For USUHS and AFHPSP, it is between the 10- and 15-year point.

From cost estimation data received from NAVMED MPTE, we calculated the average cost by accession program for FY ‘10. Based on aggregate figures, we were able to compare the short-term and long-term costs associated with each program.

When compared to “Other,” AFHPSP accessions served 16% more of the years available at 12% higher costs. Other and FAP accessions are cheaper in the short term; however, when you extend the model out to 10 years, AFHPSP gains value. For total years served, AFHPSP provides more value long term. If the MC goal is to provide long-term retention in the Navy, than accession policies should consider the long-term costs and benefits of accession programs, instead of total accessions per FY.

C. RECOMMENDATIONS

While we believe that our study provides important insight into the differing effects of accession programs on retention, we encourage future research on this topic. The limitations in our study come from the lack of suitable data that can fully address the research question and thus recommend better data collection processes from the MC community. There are many factors that affect the likelihood a medical officer will stay in the military after their initial obligation. In particular, marital status, number of dependents, and marketability and quality of medical school, are important explanatory factors to name a few. Our study was unable to address how these variables can change the likelihood of retention by different accession programs because the data do not account for variables that may change over time. Marital status information and specialty data is only provided at the time of entry into service. Both of these variables can change

over time and affect the probability of retention. Having data that shows the marital status and specialty at the end of obligated service would have enhanced this study's ability to analyze the effect on retention.

Another important variable is performance during service. While GPA is a proxy of officer quality at the time of recruitment, it does not measure the quality of performance during service. Fitness Report data would have enhanced this study's ability to show if the Navy is retaining the highest-performing medical officers.

Another limitation of the data pertains to the cohort years captured in this analysis. While 10 years of cohort data is significant, the usable data stops with FY '06. This limits our ability to study the impact of the ensuing economic recession in the following FY. The economy and employment opportunities in the civilian workforce would greatly impact a physician's decision to stay or leave the service, and this would be an area for future research. Furthermore, while deployment history was available for members on active duty, it was not available for those who are no longer on active duty. Therefore, deployment information had to be excluded as an explanatory variable. The frequency and length of deployment, especially in light of a protracted war, would definitely have an impact on retention and should be further researched. Bonus information was also not included in this analysis though we used specialty indicators to proxy for differences in bonus pay. Bonus information, including the amount offered, would affect retention especially when comparing the amount to civilian pay. Finally, we encourage better data collection processes for the MC officers in the reserves.

There are many factors that influence a member's decision to stay or leave the military. These factors are likely universal, regardless of military occupation. While these data capture several of those factors, we hope that researchers will continue to examine this research question to better assist the MC to achieve their mission.

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APPENDIX A. PRIMARY MODEL RESULTS

Primary Model – Regression Results		
Variables	(1) Probit Results	(2) Marginal Effects
USUHS	1.1577*** (0.1438)	0.2894*** (0.0208)
NADDS	-1.3105*** (0.0853)	-0.4870*** (0.0282)
NADDS_1_YR	-0.7736*** (0.1043)	-0.2962*** (0.0404)
FAP	-0.7290*** (0.1118)	-0.2793*** (0.0436)
OTHER	0.2225* (0.1242)	0.0733* (0.0384)
female	0.0547 (0.0648)	0.0189 (0.0223)
Asian	-0.0006 (0.1163)	-0.0002 (0.0406)
Black	0.0670 (0.1277)	0.0230 (0.0431)
other_race	-0.8332*** (0.1475)	-0.3198*** (0.0565)
cohort_1997	-1.7086*** (0.4145)	-0.6051*** (0.1090)
cohort_1998	-1.5019*** (0.4326)	-0.5473*** (0.1303)
cohort_1999	-1.6412*** (0.4306)	-0.5876*** (0.1199)
cohort_2000	-1.7047*** (0.4314)	-0.6046*** (0.1147)
cohort_2001	-1.7220*** (0.4314)	-0.6091*** (0.1132)
cohort_2002	-1.8035*** (0.4326)	-0.6252*** (0.1017)
prior_enlisted	-1.9582*** (0.4391)	-0.6500*** (0.0838)
prior_officer	0.1425 (0.1933)	0.0481 (0.0630)
Biological Studies	-0.0157 (0.0693)	-0.0055 (0.0242)
Engineering	-0.0212 (0.1942)	-0.0074 (0.0684)

Physical_Science	-0.0626 (0.1374)	-0.0222 (0.0493)
Psychology	-0.3602* (0.1900)	-0.1347* (0.0746)
Social_Science	0.0663 (0.2468)	0.0227 (0.0831)
Non_SCI	0.0143 (0.1085)	0.0050 (0.0376)
married	0.0174 (0.0830)	0.0061 (0.0288)
divorced	-0.1379 (0.2786)	-0.0497 (0.1033)
New_England	-0.0594 (0.1436)	-0.0210 (0.0514)
Mid_Atlantic	-0.0639 (0.0966)	-0.0226 (0.0344)
Mid_West	-0.0297 (0.0895)	-0.0104 (0.0315)
South_West	0.0300 (0.1476)	0.0104 (0.0507)
West	-0.0516 (0.0974)	-0.0182 (0.0346)
unknown_state	-0.0900 (0.0924)	-0.0318 (0.0331)
Gen_surgery	-0.1231 (0.2046)	-0.0442 (0.0753)
OTHER_SPECIALTY	-0.1103 (0.1812)	-0.0395 (0.0663)
GPA	-0.0004 (0.0003)	-0.0002 (0.0001)
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

APPENDIX B. MINORITY MODEL RESULTS

Minority Model – Regression Results		
Variables	(1) Probit Results	(2) Marginal Effects
USUHS	1.2865*** (0.3666)	0.4055*** (0.0710)
NADDS	-1.3348*** (0.2347)	-0.4810*** (0.0658)
NADDS_1_YR	-0.8762*** (0.2506)	-0.3272*** (0.0798)
FAP	-0.3610 (0.2814)	-0.1430 (0.1092)
OTHER	0.2189 (0.3135)	0.0856 (0.1199)
female	-0.0723 (0.1637)	-0.0288 (0.0651)
Asian	0.8556*** (0.2306)	0.3258*** (0.0818)
Black	1.0652*** (0.2249)	0.3887*** (0.0715)
cohort_1997	5.5132 (184.9943)	0.8702*** (0.0199)
cohort_1998	-0.0682 (0.2845)	-0.0272 (0.1133)
cohort_1999	0.3428 (0.3110)	0.1330 (0.1163)
cohort_2000	0.0344 (0.3036)	0.0136 (0.1203)
cohort_2001	0.0021 (0.3208)	0.0008 (0.1274)
cohort_2002	0.6668** (0.3172)	0.2471** (0.1042)
prior_officer	-5.5424 (184.9943)	-0.8974*** (0.0137)
Biological_Studies	-0.1817 (0.1929)	-0.0722 (0.0766)
Engineering	-0.2829 (0.4646)	-0.1124 (0.1823)
Physical_Science	-0.0344 (0.3353)	-0.0137 (0.1335)
Psychology	0.1192 (0.5919)	0.0470 (0.2312)

Social_Science	0.1736 (0.5386)	0.0681 (0.2079)
Non_SCI	-0.1572 (0.2923)	-0.0626 (0.1164)
married	0.2881 (0.2164)	0.1132 (0.0836)
divorced	0.5705 (0.5957)	0.2103 (0.1931)
New_England	0.0309 (0.3403)	0.0123 (0.1348)
Mid_Atlantic	-0.0455 (0.2539)	-0.0181 (0.1011)
Mid_West	-0.2573 (0.2411)	-0.1024 (0.0955)
South_West	0.3752 (0.4553)	0.1438 (0.1646)
West	0.0284 (0.2672)	0.0113 (0.1059)
unknown_state	-0.3316 (0.2292)	-0.1317 (0.0901)
Gen_surgery	0.0524 (0.4334)	0.0208 (0.1712)
OTHER_SPECIALTY	-0.0620 (0.3818)	-0.0247 (0.1522)
GPA	0.0013* (0.0007)	0.0005* (0.0003)
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

APPENDIX C. GENDER MODEL RESULTS

Females Only – Regression Results		
Variables	(1) Probit Results	(2) Marginal Effects
USUHS	1.0072*** (0.2673)	0.2873*** (0.0499)
NADDS	-1.3944*** (0.1622)	-0.5138*** (0.0496)
NADDS_1_YR	-0.9982*** (0.1897)	-0.3823*** (0.0668)
FAP	-0.6112** (0.2556)	-0.2381** (0.1000)
OTHER	-0.0359 (0.2969)	-0.0132 (0.1104)
Asian	-0.2032 (0.2403)	-0.0769 (0.0932)
Black	-0.0759 (0.1924)	-0.0282 (0.0722)
other_race	-1.1587*** (0.3206)	-0.4354*** (0.1017)
cohort_1997	-0.6352** (0.2538)	-0.2451** (0.0986)
cohort_1998	-0.1909 (0.2422)	-0.0717 (0.0929)
cohort_1999	-0.4426* (0.2456)	-0.1699* (0.0965)
cohort_2000	-0.3771 (0.2435)	-0.1439 (0.0952)
cohort_2001	-0.4742** (0.2384)	-0.1818* (0.0933)
cohort_2002	-0.0523 (0.2484)	-0.0193 (0.0925)
prior_officer	0.3665 (0.3803)	0.1233 (0.1146)
Biological_Studies	-0.0416 (0.1348)	-0.0153 (0.0496)
Engineering	0.0912 (0.3527)	0.0328 (0.1244)
Physical_Science	0.2888 (0.2853)	0.0993 (0.0908)

Psychology	-0.2070 (0.3898)	-0.0786 (0.1520)
Social_Science	0.2246 (0.4912)	0.0782 (0.1609)
Non_SCI	-0.0868 (0.2131)	-0.0323 (0.0802)
married	0.0369 (0.1589)	0.0135 (0.0578)
divorced	0.1721 (0.5838)	0.0607 (0.1971)
New_England	0.4400 (0.2963)	0.1449* (0.0849)
Mid_Atlantic	0.0875 (0.1825)	0.0317 (0.0652)
Mid_West	0.1743 (0.1742)	0.0624 (0.0607)
South_West	0.2348 (0.2704)	0.0819 (0.0890)
West	0.1604 (0.1892)	0.0574 (0.0658)
unknown_state	0.0928 (0.1827)	0.0336 (0.0652)
Gen_surgery	-0.6866 (0.4700)	-0.2678 (0.1808)
OTHER_SPECIALTY	0.6190 (0.4637)	0.1909* (0.1120)
GPA	-0.0010 (0.0006)	-0.0004 (0.0002)
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

APPENDIX D. GENDER MODEL RESULTS

Males Only – Regression Results		
Variables	(1) Probit Results	(2) Marginal Effects
USUHS	1.1597*** (0.1439)	0.2896*** (0.0207)
NADDS	-1.3082*** (0.0852)	-0.4862*** (0.0282)
NADDS_1_YR	-0.7705*** (0.1043)	-0.2950*** (0.0404)
FAP	-0.7337*** (0.1116)	-0.2811*** (0.0435)
OTHER	0.2158* (0.1240)	0.0712* (0.0385)
Asian	-0.0020 (0.1163)	-0.0007 (0.0406)
Black	0.0801 (0.1268)	0.0274 (0.0425)
other_race	-0.8341*** (0.1475)	-0.3201*** (0.0564)
cohort_1997	-1.6961*** (0.4142)	-0.6019*** (0.1099)
cohort_1998	-1.4917*** (0.4324)	-0.5442*** (0.1310)
cohort_1999	-1.6325*** (0.4305)	-0.5852*** (0.1205)
cohort_2000	-1.6944*** (0.4312)	-0.6019*** (0.1155)
cohort_2001	-1.7097*** (0.4311)	-0.6058*** (0.1141)
cohort_2002	-1.7905*** (0.4323)	-0.6222*** (0.1027)
prior_enlisted	-1.9425*** (0.4387)	-0.6471*** (0.0850)
prior_officer	0.1385 (0.1931)	0.0468 (0.0631)
Biological_Studies	-0.0135 (0.0692)	-0.0047 (0.0242)
Engineering	-0.0183 (0.1940)	-0.0064 (0.0683)

Physical_Science	-0.0629 (0.1373)	-0.0223 (0.0493)
Psychology	-0.3602* (0.1899)	-0.1347* (0.0745)
Social_Science	0.0663 (0.2465)	0.0227 (0.0830)
Non_SCI	0.0147 (0.1085)	0.0051 (0.0376)
divorced	-0.1384 (0.2788)	-0.0499 (0.1034)
married	0.0208 (0.0829)	0.0072 (0.0287)
New_England	-0.0616 (0.1436)	-0.0218 (0.0515)
Mid_Atlantic	-0.0644 (0.0965)	-0.0227 (0.0344)
Mid_West	-0.0322 (0.0895)	-0.0113 (0.0315)
South_West	0.0300 (0.1476)	0.0104 (0.0507)
West	-0.0547 (0.0973)	-0.0193 (0.0346)
unknown_state	-0.0925 (0.0923)	-0.0327 (0.0331)
Gen_surgery	-0.1270 (0.2046)	-0.0456 (0.0754)
OTHER_SPECIALTY	-0.1176 (0.1809)	-0.0421 (0.0664)
GPA	-0.0004 (0.0003)	-0.0002 (0.0001)
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

APPENDIX E. NADDS CONTINUATION TABLE

	Probability	1	0.99	0.96	0.72	0.36	0.18	0.15	0.12	0.09	0.07	0.07	0.06	0.06	0.05	0.05	0.05	0.04	0	0.04	0.04
Fiscal Year	Number Accessed																				
1996	23	23	23	22	17	8	4	3	3	2	2	2	1	1	1	1	1	1	1	1	1
1997	52	52	51	50	37	19	9	8	6	5	4	4	3	3	3	3	3	2	2	2	2
1998	62	62	61	60	45	22	11	9	7	6	4	4	4	4	3	3	3	2	2	2	2
1999	68	68	67	65	49	24	12	10	8	6	5	5	4	4	3	3	3	3	3	3	3
2000	82	82	81	79	59	30	15	12	10	7	6	6	5	5	4	4	4	3	3	3	3
2001	61	61	60	59	44	22	11	9	7	5	4	4	4	4	3	3	3	2	2	2	2
2002	47	47	47	45	34	17	8	7	6	4	3	3	3	3	2	2	2	2	2	2	2
2003	24	24	24	23	17	9	4	4	3	2	2	2	1	1	1	1	1	1	1	1	1
2004	21	21	21	20	15	8	4	3	3	2	1	1	1	1	1	1	1	1	1	1	1
2005	20	20	20	19	14	7	4	3	2	2	1	1	1	1	1	1	1	1	1	1	1
2006	32	32	32	31	23	12	6	5	4	3	2	2	2	2	2	2	2	1	1	1	1
2007	26	26	26	25	19	9	5	4	3	2	2	2	2	2	1	1	1	1	1	1	1
2008	43	43	43	41	31	15	8	6	5	4	3	3	3	3	2	2	2	2	2	2	2
2009	57	57	56	55	41	21	10	9	7	5	4	4	3	3	3	3	3	2	2	2	2
2010	67	67	66	64	48	24	12	10	8	6	5	5	4	4	3	3	3	3	3	3	3
Years of Service		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

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APPENDIX F. NADDS 1-YEAR DELAY CONTINUATION TABLE

	Probability																			
	1	0.99	0.96	0.71	0.46	0.39	0.34	0.31	0.26	0.22	0.18	0.15	0.12	0.11	0.1	0.09	0.09	0.08	0.07	0.07
Fiscal Year	Number Accessed																			
1996	28	28	28	27	20	13	11	10	9	7	6	5	4	3	3	3	3	2	2	2
1997	19	19	19	18	13	9	7	6	6	5	4	3	3	2	2	2	2	2	1	1
1998	30	30	30	29	21	14	12	10	9	8	7	5	5	4	3	3	3	2	2	2
1999	43	43	43	41	31	20	17	15	13	11	9	8	6	5	5	4	4	4	3	3
2000	24	24	24	23	17	11	9	8	7	6	5	4	4	3	3	2	2	2	2	2
2001	12	12	12	12	9	6	5	4	4	3	3	2	2	1	1	1	1	1	1	1
2002	26	26	26	25	18	12	10	9	8	7	6	5	4	3	3	3	2	2	2	2
2003	23	23	23	22	16	11	9	8	7	6	5	4	3	3	3	2	2	2	2	2
2004	27	27	27	26	19	12	11	9	8	7	6	5	4	3	3	3	2	2	2	2
2005	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	20	20	20	19	14	9	8	7	6	5	4	4	3	2	2	2	2	2	1	1
2007	13	13	13	12	9	6	5	4	4	3	3	2	2	2	1	1	1	1	1	1
2008	6	6	6	6	4	3	2	2	2	2	1	1	1	1	1	1	1	0	0	0
2009	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Years of Service	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

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APPENDIX G. FAP CONTINUATION TABLE

	Probability	1	0.99	0.95	0.83	0.58	0.42	0.32	0.29	0.24	0.19	0.16	0.14	0.13	0.09	0.08	0.05	0.03	0.01	0.01	0.01
Fiscal Year	Number Accessed																				
1996	18	18	18	17	15	10	8	6	5	4	3	3	3	2	2	1	1	1	0	0	0
1997	13	13	13	12	11	8	5	4	4	3	2	2	2	2	1	1	1	0	0	0	0
1998	17	17	17	16	14	10	7	5	5	4	3	3	2	2	2	1	1	1	0	0	0
1999	19	19	19	18	16	11	8	6	6	5	4	3	3	2	2	2	1	1	0	0	0
2000	32	32	32	30	27	19	13	10	9	8	6	5	4	4	3	3	2	1	0	0	0
2001	34	34	34	32	28	20	14	11	10	8	6	5	5	4	3	3	2	1	0	0	0
2002	23	23	23	22	19	13	10	7	7	6	4	4	3	3	2	2	1	1	0	0	0
2003	19	19	19	18	16	11	8	6	6	5	4	3	3	2	2	2	1	1	0	0	0
2004	27	27	27	26	22	16	11	9	8	6	5	4	4	4	2	2	1	1	0	0	0
2005	11	11	11	10	9	6	5	4	3	3	2	2	2	1	1	1	1	0	0	0	0
2006	10	10	10	10	8	6	4	3	3	2	2	2	1	1	1	1	1	0	0	0	0
2007	9	9	9	9	7	5	4	3	3	2	2	1	1	1	1	1	0	0	0	0	0
2008	14	14	14	13	12	8	6	4	4	3	3	2	2	2	1	1	1	0	0	0	0
2009	7	7	7	7	6	4	3	2	2	2	1	1	1	1	1	1	0	0	0	0	0
2010	17	17	17	16	14	10	7	5	5	4	3	3	2	2	2	1	1	1	0	0	0
Years of Service		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

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APPENDIX H. OTHER CONTINUATION TABLE

	Probability	1	0.99	0.9	0.73	0.6	0.53	0.46	0.39	0.37	0.3	0.28	0.25	0.22	0.23	0.21	0.19	0.19	0.17	0.15	0.12
Fiscal Year	Number Accessed																				
1996	21	21	21	19	15	13	11	10	8	8	6	6	5	5	5	4	4	4	4	3	3
1997	31	31	31	28	23	19	16	14	12	11	9	9	8	7	7	7	6	6	5	5	4
1998	28	28	28	25	20	17	15	13	11	10	8	8	7	6	6	6	5	5	5	4	3
1999	22	22	22	20	16	13	12	10	9	8	7	6	6	5	5	5	4	4	4	3	3
2000	13	13	13	12	9	8	7	6	5	5	4	4	3	3	3	3	2	2	2	2	2
2001	34	34	34	31	25	20	18	16	13	13	10	10	9	7	8	7	6	6	6	5	4
2002	15	15	15	14	11	9	8	7	6	6	5	4	4	3	3	3	3	3	3	2	2
2003	10	10	10	9	7	6	5	5	4	4	3	3	3	2	2	2	2	2	2	2	1
2004	12	12	12	11	9	7	6	6	5	4	4	3	3	3	3	3	2	2	2	2	1
2005	14	14	14	13	10	8	7	6	5	5	4	4	4	3	3	3	3	3	2	2	2
2006	14	14	14	13	10	8	7	6	5	5	4	4	4	3	3	3	3	3	2	2	2
2007	8	8	8	7	6	5	4	4	3	3	2	2	2	2	2	2	2	2	1	1	1
2008	13	13	13	12	9	8	7	6	5	5	4	4	3	3	3	3	2	2	2	2	2
2009	17	17	17	15	12	10	9	8	7	6	5	5	4	4	4	4	3	3	3	3	2
2010	22	22	22	20	16	13	12	10	9	8	7	6	6	5	5	5	4	4	4	3	3
Years of Service		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

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